Citation:

Grabowski DC, Ellis JE. High body mass index does not predict mortality in older people: analysis of the Longitudinal Study of Aging. *J Am Geriatr Soc.* 2001 Jul;49(7):968-79.

PubMed ID: 11527490

Study Design:

Retrospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To test the hypothesis that older, community dwelling individuals who are very obese would have greater mortality than normal or thin individuals.

Inclusion Criteria:

- Participation in the Longitudinal Study of Aging with baseline interview in 1984
- Noninstitutionalized individuals
- Age 70 or older

Exclusion Criteria:

- Not a participant in LSOA study
- Younger than 70 years of age
- Institutionalized status.

Description of Study Protocol:

Recruitment

- Recruitment methods for the LSOA not discussed

Design: Retrospective cohort study

- Baseline interviews for the LSOA were conducted in individuals' homes, with family members interviewed if participants were unable to answer the survey
- Data obtained from the initial LSOA study in 1984 was used
- Mortality and obesity were the variables of interest Mortality information was obtained from the linked National Death Index for the LSOA population for 8 years from the beginning of

the study
- BMI was calculated using self-reported heights and weights. Individuals were placed into one of three groups dependent on BMI for analysis
- Variables used to construct multivariable models of mortality guided by the behavioral model of health services utilization
    - Model one: baseline weight and mortality data
    - Model two: baseline plus poverty data
    - Model three: beginning with subjects alive 2 years after initial survey
    - Model four: baseline plus controls for self-reported serious medical conditions
    - Model five: subset of model one, including only those without serious medical comorbidities at baseline

Blinding used (if applicable): not applicable

Intervention: Not applicable

Statistical Analysis

- Cox proportional-hazards analysis to assess associations between BMI and mortality
- Statistical significance assessed at p=0.05 level.

Data Collection Summary:

Timing of Measurements

- Baseline information collected in 1984
- Survival measured for eight years from the beginning of the survey in January 1984 until December 1991 using the National Death Index
- BMI calculated using self-reported height and weight collected at baseline

Dependent Variables

- Mortality

Independent Variables

- Obesity

Control Variables

- Demographics including age, sex, race and region of country
- Ethnicity
- Education level
- Health insurance status
- Level of ability to care for self
- Health services utilization
- Income
- Self-reported medical conditions

Description of Actual Data Sample:

Initial N: 7,527 subjects

Attrition (final N): 7,459 subjects provide information to match the National Death Index (62% female, 38% male)

Age: 76.8±5.59 years

Ethnicity: 91.4% White, 7.4% Black, 2.9% Hispanic, 1.2% Other

Other relevant demographics:

- 17.7% of subjects with income level below the poverty threshold
- Over one-third of subjects lived alone
- 72% of subjects had private insurance

Anthropometrics:

- BMI 24.4±4.33 kg/m^2
- Men had statistically significantly higher BMI than women (24.56±3.64 kg/m^2 versus 24.3±4.72 kg/m^2 SD; p=0.127)
- BMI values for women appeared less normally distributed with a broader tail at high BMI values
- Body mass variables (7,397 subjects)
    - Thin (lowest 10% of BMI distribution): 9.9%
    - Normal weight (not classified as thin or obese): 75%
    - Obese (highest 15% of BMI distribution): 15%.

Location: United States

Summary of Results:

Key Findings

- 38.5% of subjects died between January 1984 and December 1991
- Kaplan Meier survival curves across the thin, normal and obese weight categories show highest mortality among the thin group and lowest in the obese group
- Highly significant differences across weight categories (F=52.34, p<0.001); thin group had highest mortality (53.9%) of the three weight categories whereas the obese group had the lowest (33.5%)
- Incorporating the poverty indicator (in model two) strengthened relationships between increased BMI and decreased mortality
- Model three eliminated the first two years of mortality reduced the number of deaths available for modeling with resulted in significantly lower mortality in the obese group at 83 months of follow-up but by 96 months mortality in the obese was no longer significantly different (hazard ratio 0.93, 95% CI 0.82-1.06, p=0.27)
- Model four, addition of self-report medical conditions, results were only marginally different from models one or two
- Model five, included those healthy at baseline, obesity was strongly associated with lower mortality (hazard ratio=0.67, 95% CI=0.51-0.88) whereas the thin group had higher mortality (hazard ratio=1.4, 95% CI=1.13-1.74).

Model	Hazard Ratio and	Hazards Ratio and

	95% CI in the Obese group P value	95% CI in the Thin Group P value
Model One: baseline (n=7,048)	0.86 (0.77-0.97) p=0.011	1.46 (1.30-1.64) p=0.000
Model Two: baseline plus poverty data (n=5,916)	0.84 (0.74-0.95) n=0.007	1.55 (1.36-1.75) p=0.000
Model Three: beginning with those alive two years after initial survey (n=6,510)	0.93 (0.82-1.06) p=0.268	1.38 (1.2-1.57) p=0.000
Model four: baseline plus controls for self-reported serious medical conditions (n=6,888)	0.83 (0.74-0.94) p=0.002	1.58 (1.41-1.78) p=0.000
Model five: subset of model on, including only those without medical condition comorbidities at baseline (n=2,378)	0.67 (0.51-0.88) p=0.004	1.40 (1.13-1.74) p=0.002

Author Conclusion:

In contrast to many studies showing increased mortality in younger obese populations, the analysis of the LSOA suggests a decreased mortality in obese older people. Lower mortality in obese older people persisted despite controlling for many different confounders. Study results add to those of others that suggest weight goals appropriate in younger age groups may be inappropriate for older individuals.

Reviewer Comments:

- *Large, nationally representative sample*
- *Majority of subjects were of white ethnicity; limited diversity of subjects*
- *Did not control for smoking*
- *Self-reported heights and weights introduce possible inaccuracies.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A

3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes

6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	No
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	No
7.5.	Was the measurement of effect at an appropriate level of precision?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	No
7.7.	Were the measurements conducted consistently across groups?	???
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes

8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes